The Balloon-borne Large Aperture Telescope for Polarization - BLASTPol

Completed Technology Project (2017 - 2020)

Project Introduction

We are proposing a comprehensive program to study the link between Galactic magnetic fields and star formation. After decades of study, the physical processes regulating star formation still remain poorly understood. Large-scale observations of star forming regions provide counts of the number of dense clouds each of which will eventually evolve into tens to hundreds of stars. However, when simple models of gravitational collapse are applied to the clouds they yield a Galactic star formation rate (SFR) which is many times what is actually observed. Some process or combination of processes must be slowing the collapse of the clouds. The two prevailing theories involve turbulence which prevents the effective dissipation of energy and Galactic magnetic fields which are captured and squeezed by the collapsing cloud provide a mechanism for mechanical support. Understanding these effects fits very well the SMD 2010 Science Plan's Cosmic Origins program. The Balloon-borne Large Aperture Telescope - BLAST was originally designed to conduct confusion-limited and wide-area extragalactic and Galactic surveys at submillimeter wavelengths from a long-duration balloon (LDB) platform. These wavelengths are impossible or very difficult to observe from even the best ground-based telescope sites. After a series of successful flights (Ft. Sumner 2003, Sweden 2005, and Antarctica 2006) resulting in over 25 publications, BLAST was converted to BLASTPol. The combination of a polarizing grid in front of each of the 266 feed horns at 250, 350 and 500 micron with a stepped Half Wave Plate (HWP) provided a quick and inexpensive way to make initial measurements of polarized dust emission in star forming regions. By mapping polarization from dust grains aligned with respect to their local magnetic field, the field orientation (projected on the sky) can be traced. The development of the Next Generation BLASTPol instrument is now complete. It has increased spatial resolution (22 arcseconds at 250 microns), four times the field of view (340 square arcminutes) and 12 times the mapping speed of the previous instrument. The focus of this three year proposal is to fly BLASTPol, make deep maps of star forming regions with sizes ranging from 0.25 to 20 square degrees, and to probe galactic dust as a foreground for future Cosmic Microwave Background experiments. This work also includes an extensive data analysis phase.

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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

Trustees of the University of Pennsylvania

Responsible Program:

Astrophysics Research and Analysis

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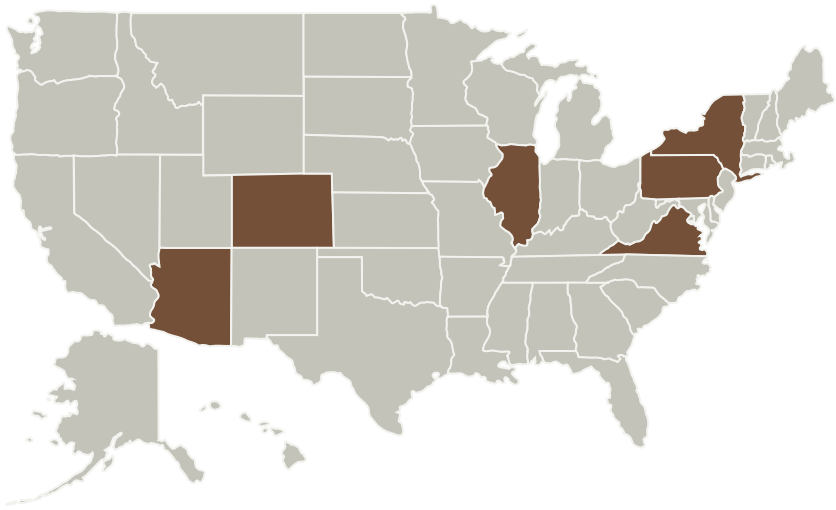
Primary U.S. Work Locations and Key Partners



Project Management

Program Director:

Michael A Garcia

Program Manager:

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Principal Investigator:

Mark J Devlin

Co-Investigators:

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Leona Joseph
Derek Ward-thompson
Philip Mauskopf
Yasuo Fukui
Christopher E Groppi

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

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Organizations Performing Work	Role	Type	Location
Trustees of the University of Pennsylvania	Lead Organization	Academia	Philadelphia, Pennsylvania
Arizona State University-Tempe(ASU)	Supporting Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH)	Tempe, Arizona
Cardiff University	Supporting Organization	Academia	Cardiff, Outside the United States, United Kingdom
Clinical Practices of the University of Pennsylvania	Supporting Organization	Academia	Philadelphia, Pennsylvania
Columbia University in the City of New York	Supporting Organization	Academia	New York, New York
La Sapienza università di Roma	Supporting Organization	Academia	Roma, Outside the United States, Italy
Max-Planck-Institut für Astronomie(MPIA)	Supporting Organization	Industry	

Continued on following page.

Target Destination

Outside the Solar System

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Organizations Performing Work	Role	Type	Location
Nagoya University	Supporting Organization	Academia	Nagoya, Aichi, Outside the United States, Japan
National Institute of Standards and Technology(NIST)	Supporting Organization	US Government	Boulder, Colorado
Northwestern University	Supporting Organization	Academia	Evanston, Illinois
University of British Columbia	Supporting Organization	Academia	Vancouver, Outside the United States, Canada
University of New South Wales	Supporting Organization	Academia	
University of Toronto	Supporting Organization	Academia	Toronto, Canada
University of Virginia-Main Campus	Supporting Organization	Academia	Charlottesville, Virginia

Primary U.S. Work Locations	
Arizona	Colorado
Illinois	New York
Pennsylvania	Virginia